The Scientific Review,

AND

SCIENTIFIC AND LITERARY REVIEW,

A RECORD OF PROGRESS IN ARTS, INDUSTRY, AND MANUFACTURES,

INCORPORATING THE

Journal of the Inventors' Institute.

REGISTERED FOR TRANSMISSION ABROAD.]

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VOL. XVII.—No. 10.] OCTOBER 2, 1882. [PRICE 6d.

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⁂ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

Examination of Wine with Catgut.—The determination of the astringent matters contained in wine is considered a most delicate operation. These matters are various; the principal is a tannic compound called *æno-tannin*, and there are several colouring-matters closely related to it. The ordinary methods of determination are rather uncertain, especially where there is little astringent matter. M. Girard has lately devised a method of very simple nature, which has proved to be superior in precision to the others. It depends on the tendency of the matters in question to combine with animal tissues. Long ago Pelouze used skin to separate tannin from gallic acid; others have analysed bark by a process based on absorption of tannin by skin. Some chemists seem to have even tried ordinary skin in the analysis of wines, but it is not well suited for this. M. Girard finds in catgut a pure animal tissue, of definite chemical species, a much better means of determination. He takes some of the fine white violin cords prepared by M. Thibouville-Lamy, the last process of polishing with oil having been omitted. Four or five of these are put together. A certain quantity is soaked in water for four or five hours (one grain having previously been detached to ascertain the water in it); then these swollen portions are put in a known quantity of the wine to be analysed. This is quickly altered in consequence; in twenty-four hours generally, or forty-eight at most, all colour has disappeared. The tanned and dyed portions of cord are then dried, first in a flat dish, then in a closed vessel at higher temperature. A comparison then made of the original cord (free from water) with the same cord tanned, coloured, and dried, affords a correct estimate of the *æno-tannin* and colouring-matters of the wine.

Reviews.

KING'S TREATISE ON COAL GAS.

WALTER B. KING, 11, Bolt Court, Fleet Street, London.

THIS is a magnificent work forming three extensive volumes, and may be looked upon as perhaps the only treatise in the English language which can at all lay claim to being a really comprehensive text-book on the subject of coal gas.

The first volume treats of the History, the Manufacture, and the Purification of Gas. The second volume deals with the Chemistry, the Storage, and the Distribution. The third volume considers the question of Consumption, the various Residuals, and Miscellaneous applications and uses.

The work throughout is splendidly printed and profusely illustrated, and has had engaged upon its production some of the ablest writers upon the subject now obtainable.

We have no hesitation in saying that the work now brought under our notice will become indispensable to all who are extensively interested in the great question of gas; while to the professional gas engineer it must form a standard book of reference, the want of which has been long felt.

STEAM FIRE ENGINES.

WE believe we are correct in stating that the first steam fire engine was built by Braithwaite, of London, in 1829, and that it was ten horse-power. We cannot obtain any description of the details of this engine, but it was capable of delivering about 90 tons of water per hour.

Soon afterwards Mr. Braithwaite constructed another engine of six horse-power, having a cylinder of 7 inch diameter with 16 inch stroke, and a double acting pump 6½ inch diameter, running 45 strokes to the minute.

This machine was capable of delivering 40 tons of water per hour, to a height of 90 feet. Both its pistons were on one rod, and the slide valve, feed pump, and blowing apparatus were all worked from a cross head attached to the piston rod, which operated a tappet lever. The boiler was very like that of the "Novelty" locomotive, which in its trials on the Manchester and Liverpool railway in 1829, attained the speed of 32 miles an hour. It had applied to it a blowing mechanism, used a very small quantity of fuel, and consumed its own smoke.

Its weight was 45 cwt., and although wanting in many qualities requisite in an engine for regular service, it nevertheless was highly efficient in its working, more so than some even of the present day. Braithwaite built his next engine in 1832; it was named the "Comet," and was constructed for the Prussian government. The boiler arrangement was similar to the last one; but the engine was designed for considerably greater power. It had two cylinders, each of 12 inch diameter, with a stroke of 14 inches, also two pumps 10½ inches in diameter, and worked at 18 double strokes per minute. It could throw a jet of water 1¼ inch to a height of 120 feet; steam could be got up to a pressure of 70 lbs, in twenty minutes, and its weight was about four tons. This engine was in working order up to several years ago, and was employed in pumping water at a mine.

In none of these engines was a fly-wheel used, nor were the two subsequent engines built by Braithwaite different in this respect; in fact they were very similar in character altogether.

Some twenty years elapsed before any further efforts were made in this country with regard to steam fire-engines. During this time Captain Ericson became connected with Braithwaite's firm, and afterwards left England and settled in America, where in 1841 he constructed an engine similar to Braithwaite's first, with the exception of having a locomotive boiler. For this he obtained a gold medal from the Mechanics' Institute of New York. Another engine constructed in New York was by Hodge, in which steam was used to help the horses. In 1850, Latta, of Cincinnati, built a similar one, which weighed 12 tons. Great activity in the manufacture of steam fire-engines commenced in America about this time, and many varieties were introduced; some rotary, and others having both single and double reciprocating motions; nearly all were vertical, with fly-wheels, and the works were bolted on to the boiler.

The performance of some of these engines as well as the workmanship is very good; but nearly all of them are utterly unsuited for work in our narrow thoroughfares, mostly on account of their being top-heavy, and unable to be turned in their own length.

In 1852 steam was used to work the floating engines on the Thames. Before this time, these had two 9-inch pumps, and were worked by 60 to 80 men; but the levers for working them by hand were removed, and steam cylinders were placed directly over the pumps. The result proved so satisfactory that an entirely new float was built by Mare, of Blackwall, and fitted with engines built by Shand and Mason, and was for a long time stationed at Southwark Bridge. The vessel was constructed 130 feet long, and the engines were 80 horse-power; they had steam cylinders of 14 inch diameter with 18 inch stroke, and the pumps were double acting. This engine with four deliveries on deck was capable of discharging 2000 gallons of water per minute. The propulsion of this vessel through the water was very slow; it was driven by a centrifugal pump discharging through outlets at the sides.

A considerably larger float than the one just mentioned has been built, having a pumping power of 4000 gallons per minute. These vessels have many drawbacks, the greatest being probably their slow speed; at the same time their size combined with the mode of propulsion adopted, forms an important objection, as they are rendered difficult to manage; in fact, at low tides the larger of these may be said to be practically useless in the Thames.

What is wanted to make steam floating fire engines thoroughly efficient is, that they should be fitted with twin screws driven by separate and distinct engines from those driving the pumps, and constructed with boiler power sufficient for both purposes. There would then be no difficulty in discharging 2500 gallons per minute and steaming from 12 to 14 knots per hour.

From 1858 to 1860 Shand and Mason built some land steam fire-engines, one of which was for the London Fire Engine Establishment. Much was expected from this engine, but it was found to give in practice a good deal of trouble, and it was, therefore, soon withdrawn to make way for an improved model, of which several were built from 1860 to 1863. Two of these had vertical tubular boilers with horizontal works, each had a steam cylinder 8½ inch in diameter with 7 inch stroke, and double acting pumps. The weight was nearly 2½ tons, and they were capable of delivering 450 gallons per minute. One of these (No. 10), will be remembered by firemen as having done good service.

In 1861 Merryweather and Sons constructed their first steam fire-engine, the "Deluge," which delivered 450 gallons per minute. In the following year the same firm built their second engine, the "Torrent." In 1862 Roberts, of Millwall, constructed his first self-propelling steam fire-engine, which could steam on common roads at the rate of 18 miles an hour, and was in many respects a rather remarkable production.

On July 1st, 1863, there took place a trial of steam fire-engines in the grounds of the Crystal Palace, Sydenham. The exhibitors were Shand and Mason, Merryweather and Son, Roberts, Easton and Amos, Gray and Son, and an American firm.

The "Sutherland," constructed by Messrs. Merryweather, took the first prize for heavy engines. It drew water 16 feet 4 inches vertically, and delivered it through 440 feet of hose, with a 1½ inch jet, and filled a tank containing 16.000 gallons in 1 hour 22 minutes 30 seconds. It had two horizontal cylinders, 8½ inch diameter, by 24 inch stroke, with two double-acting pumps, 6½ inch diameter. The boiler contained about 40 gallons of water up to the working level, and was filled with "Field" tubes, and would raise steam to 100 lbs. in ten minutes and a quarter.

Messrs. Shand and Mason obtained the second prize with a similar engine to their celebrated "Number 10," only it had two cylinders instead of one. It could get up steam to 100 lbs. in eleven minutes and three quarters.

The "Princess of Wales," built by Mr. Roberts, gave great satisfaction, and it was afterwards placed at the Tooley Street Station of the London Brigade, where it did good service between 1863 and 1866.

Shand and Mason also took the first prize for light engines, by one having a vertical boiler, surrounded by a water space. The works were also vertical and secured to the hinder part of the boiler by brackets.

The result of this trial was to place the construction of steam fire-engines practically in the hands of two English firms, for nearly all countries except America.

Without in any degree desiring to depreciate what has already been accomplished in perfecting these important machines, we nevertheless desire to point out that much requires to be done before steam fire-engines, at any rate those required on land, are brought to that state of efficiency which the public service in this age requires. The construction should be such that steam can be not only quickly raised, but retained at an even pressure; delivering a reasonable quantity of water, say 200 in small, and 500 gallons in large engines, per minute, should be easy to manage, strong enough to stand the rough usage of fire practice, and at the same time capable of being rapidly drawn by a couple of horses.

That this much has not yet been attained in practice goes without saying, and if our remarks should be the means of inducing some engineers to turn their serious attention to the subject, by which means further progress may be made in steam fire engines, our object will have been reached.

STEAM WHEELS.—A new kind of steam engine has been recently patented in Austria by Professor Wellner, of Brünn. The so-called "steam wheel" (according to the account in the *Polytechnisher Journal*) consists of a simple water wheel, mostly immersed in hot water in a closed vessel. Steam is admitted at the lower part, and forces the cells of the wheel upward, producing rotation. The steam fills more and more of the cells on the rising side, and at length begins to escape into the steam-space above the water. Steam may either be produced directly at the lower part, or conducted to the vessel from elsewhere. The upper tube for outlet of steam may lead either into the open air or into a condenser. The mechanical work consists in the ascent of the specifically lighter steam in the heavier liquid. These steam-wheels may either be used as independent motors, or in connection with ordinary steam engines; in the latter case the escape-steam of one kind of machine is utilised for the other.

MICRO-ORGANISMS.

Up to very recent years the microscope was very properly regarded, for the most part, as a very expensive scientific toy. At the present day, it has assumed the position of being one of the most important instruments of practical research in existence, and in no department is it playing so important a part, perhaps, as in the investigation of those minute organisms, which, in many instances, are the direct cause of disease—if not actually the disease itself—in the higher organised beings, including man himself.

Now, it cannot be too plainly pointed out to the constantly-increasing number of workers in this department, that there is great danger of important errors of observation arising from the instrument itself, in consequence of the necessary employment of lenses of high power; and as this occurs, even when using the best objectives obtainable, the greatest care is needed to eliminate such errors.

The eye itself, as is well known to practiced microscopists, is a source of deception. There are, perhaps, five or six sets of appearances which interfere with microscopical observations, and as three of these have a very near resemblance to micro-organisms, it is highly important to be able to differentiate them from their surrounding realities.

Prevost has described the first of these appearances as somewhat like unto a string of pearls, while the second set appears like a number of isolated spores, and the third set, which is probably the most misleading of all, resembles, curiously enough, yeast cells containing a nucleus.

We call attention to these facts, inasmuch as instances have come under our observation, where gravely erroneous statements have been made by conscientious, if not experienced, microscopists, which have caused much trouble to rectify; and, as workers in this department are rapidly on the increase, a warning of this description may save much labour, and not a few bewildering and misleading impressions.

We commend to the members of the various microscopical societies the following Prototypes for observation, and the study of their various phases of existence. Take, for example, the several species of the *Protococus*, which exists in two states, the still form and the mobile condition. In the latter they possess a pair of cilia, with which the cell is propelled through the water in a rolling fashion. In this state the *Protococus* resembles the zoospores of higher algæ, and it has been thought that they bear the same relation to fully developed algæ as the *Torula*, or yeast plant, bears to certain fungi.

Then there is the *Pamella prodigiosa*, which exists as minute cells in the brick-coloured patches appearing upon neglected flour paste, and other farinaceous substances.

Next we will mention the *Bacillus anthracis*, the supposed germ of splenetic fever. This, in its most highly organised form, appears to consist of long mycelioid filaments, from the protoplasm of which the spores are elaborated. When these spores are set free, they germinate in several distinct ways: first by fission, like those of *Protococus*; and secondly, by growing into short rods, which contract in the middle and bisect; and thirdly, by growing into long filaments, which again give rise to the true spores.

The *Bacterium termo* very closely resembles some of the *Bacillus* genus, as it forms short-jointed rods and long filaments laden with spores. *Bacteria* are, of course, everywhere, and there is little doubt have much to do with various diseases in man. This is probably on account of their extreme minuteness, and not being killed by drying up, as the spores are thus easily carried about by air currents. This is readily understood when it is remembered that the largest *Bacterium* is not more than the 1-10,000th part of an inch in breadth, and that the upward current of air produced by the evaporation of water in which they might be, and at the ordinary temperature of the atmosphere, is quite sufficient to raise them from the liquid.

There is also the *Spirillum volutans*, which is a delicate little corkscrew-like organism, which produces filaments. After some time these filaments break up, and the freed spores encyst and divide. These, on germinating, form comma-like bodies, which eventually pass through the corkscrew form into the complete condition of long motile filaments laden with spores. And here we would caution observers that when prototypes of these kinds are seen for the first time, it is very possible that only one phase of their existence will be detected, and that, therefore, careful and prolonged observation is needed on behalf of all who desire to add to the sum of knowledge in this field of investigation.

We call attention, also, to the fact that many lichen and fungi spores are capable of reproduction by the simple process of gemmation, without passing through the system of fructification, which is characteristic of the complete fungus.

This double method of reproduction happens with the *Papulaspora sepedomoides*, a red fungus found on stale rice paste, as well as with the more common moulds and mildews, such as the *Penicillium crustaceum*, the *Mucor mucedo*, and the *Ascophora mucedo*.

Workers who seek a reputation in the world of science, and yet have not the patience to slowly attain it by continued study, mental discipline, and most careful observations, will only be drawing general inferences from particular and half-understood facts, which will certainly result in detriment to themselves, and confusion to others.

LIGHTHOUSES AND LIGHTSHIPS.

Perhaps it is the great service which lighthouses and lightships have rendered to humanity which has prevented their being further utilised for the purpose of saving life and property, as well as for other useful objects.

Great as has been the benefit to the nation at large, and to the sea-going community in particular, of these valuable institutions, we are convinced that their efficiency may be enormously increased by some simple and not very expensive additions.

How often it happens, in case of shipwreck on a rock or sand-bank, which is marked by a lighthouse or lightship in the locality, that no signals can be seen from the shore for hours, in consequence of the driving sleet, or partial fog, obscuring the lights made on the ships in distress, or at the lightship station, which in many cases is miles away from the land. Again, there has frequently been illness on board these lonely stations, when, from the peculiarity of the weather, it has been impossible to communicate with medical assistance. Added to this, the inhabitants of these sea-bound homes are cut off from intercourse with their friends under circumstances which are sometimes of a distressing nature. And yet all this could be remedied, and other great advantages obtained, by an application of scientific resource, which ought to have been made long ago, if from no better motive than the purest selfishness.

What is urgently wanted, and we trust will be quickly effected, is the laying of a light cable from the mainland to every lighthouse and lightship around the British Isles. These could be provided with telegraphic or telephonic apparatus, and thus be the means of placing every light-station in direct communication with the shore, and, when necessary, with the authorities.

We are inclined to think that the ordinary Morse instrument would be preferable to the use of the telephone, for several reasons; as it would be independent of the noise of a storm, and compel the light-keepers to become familiar with the Morse code. This would not only enable them to work the telegraph instruments, but would also give them the means of communicating with vessels, by sound or flash telegraphy. In this way they could ascertain the need for pilots or tugboats, and communicate such to the port; also special and important information from outward and inward bound ships; as well as special instructions from shore.

In case of a wreck, or a ship in distress, being observed by the light keeper, immediate knowledge of the fact could be at once forwarded to the life-boat station; this advantage alone would cause many valuable lives and much property to be saved, but which, under present arrangements, are unfortunately lost.

Captains would be enabled in bad weather to ascertain the condition of the sea on the bars, or outside channels, previous to starting; and incoming vessels could be warned of obstructions in foggy weather. And last, but by no means least, in case of any hostile approach to our shores, a means of early observation, with timely warning, would be provided.

This latter consideration should be sufficient to induce the Government to at once commence this work; but if they neglect their duty in this regard, we think the funds of the Royal Lifeboat Institution might be as usefully applied in this direction as in the multiplication of boats. We do not desire to depreciate in the slightest degree the value of lifeboat building; but we are perfectly sure that complete telegraphic arrangements such as we have pointed out would render every lifeboat worth two, as at present available.

Utilising Smoke from Wood.—At Elk Rapids, Michigan, is a blast furnace in which are manufactured 50 tons of charcoal iron per day. There are 25 charcoal pits, constructed of brick. Each pit is filled with 100 cords of hard wood and then fired. The vast amount of smoke from these pits, which was formerly lost in the air, has now been utilised by Dr. Pierce, a chemist. Chemical works have been erected, which are thus described:—First, they have a circular tube made of wood, with pine staves 16 feet in length, bound together with heavy iron hoops. This tube is placed over the pits in a horizontal position, with an opening from each pit into the tube. At the end nearest the building there is a large drum containing a rotary fan propelled by machinery, the power of which is gas. That acts as a suction or draft for the smoke, which is conveyed into five stills filled with copper pipe 2½ inches in diameter. The boxes in which the pipes are situated are 20 feet square, 8 feet deep, made of heavy pine, and filled with cold water; these are all connected by copper pipes; they are connected with the main still 100 feet in length, 10 feet wide, 8 feet deep, filled with copper pipes 2½ inches in diameter in a horizontal position, surrounded with cold water; from this conveyed to a purifier, from which runs what is called pyroligneous acid, which is as clear as amber, with an unpleasant odour. From this acid is produced:—First, acetate lime; second, alcohol; third, tar; the fourth part produces gas, which is consumed under the boilers. Each cord of wood contains 28,000 cubic feet of smoke; 2,800,000 feet of smoke handled every 24 hours producing 12,000 pounds acetate of lime, 200 gallons alcohol, 25 pounds tar. These articles have a commercial value in the manufacturing of various articles. The alcohol has been contracted to a firm in Buffalo, New York, for five years, they furnishing the packages and receiving it at the works at 80 cents. per gallon. The smoke from 40,000 cords of wood consumed per annum is thus made a source much of profit as the works are nearly automatic.

The Scientific Review

AND

SCIENTIFIC AND LITERARY REVIEW,

A RECORD OF PROGRESS IN
ARTS, INDUSTRY, AND MANUFACTURES,
INCORPORATING THE
JOURNAL OF THE INVENTORS' INSTITUTE,
(*Established* 1865.)

Is published on the first of every month at the
OFFICES, 21, COCKSPUR STREET, CHARING CROSS,
LONDON, S.W.

The SCIENTIFIC REVIEW will be sent post free on prepayment of the ANNUAL SUBSCRIPTION OF 6s. 6d.: or it may be had wholesale from Messrs. KENT AND CO., Paternoster Row, or through any Bookseller or Newsagent in the kingdom, price 6d. per copy. Single copy post free from the office, 6½d.

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Editor: 21, Cockspur Street, Charing Cross, S.W.

THE INVENTOR'S INSTITUTE,

4, ST. MARTIN'S PLACE, TRAFALGAR SQUARE. LONDON.
ESTABLISHED 1ST MAY, 1862.

President: HIS GRACE THE DUKE OF MANCHESTER.

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SESSION 1881—1882.

If any meeting be held special notice *per post* will be supplied.

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F. W. CAMPIN, Sec.

Proceedings of the Institute.

Probably a meeting on the Patent Laws will be held during this month, of which due notice will be given to the Members.

Annual Dinner.—It is proposed to have the usual Annual Dinner at the beginning of the Session, and the Dinner Committee will be glad to receive names of gentlemen who are willing to act as Stewards.

Monthly Notices.

Lime for Blasting Purposes.—Mr. W. Crawford, the secretary to the Miners' National Union, has issued a circular to the miners on the lime process now being extensively resorted to as a means of getting coal in preference to powder. He says in long wall workings it is an entire success. To put it into general use it will require some little alteration, but if by the process the coal can be as easily got, and in better condition than when powder is used, it becomes the duty of the State to enforce its general use, or at any rate to prohibit the use of blasting-powder where there is the remotest risk of an explosion taking place.

Paper Wheels.—The new paper wheels which are coming into use so largely in the United States are about to be introduced into Germany. The *Vessische Zeitung* states that the celebrated establishment of Herr Krupp at Essen has just received from a Prussian railway company an important order for railway wheels, of which the box only will be of metal, while the spokes and the fellies will be made entirely of paper by Messrs. Adt Brothers, paper makers at Forbach. M. Puttmann, director of the New York and Jersey Railroad, has, after many years' experience of paper wheels, reported that their durability is tenfold greater than that of the ordinary wheels made of iron. They are admitted, however, to involve in the outset a greater expense.

Cheese-Making.—A French chemist, M. E. Duclaux, has made some interesting experiments in cheese-making, with a view mainly to discover the causes which determine the flavour of cheeses. It has often been asked why cheese made in different districts in a precisely similar manner vary greatly in flavour, while those of one particular spot, although manufactured in very different ways, are almost precisely alike to the taste. The researches of M. Duclaux tend to prove that neither climate, soil, food, manipulation, nor variety in the breed of cows largely affects the quality of the cheese. It would appear rather that a fungus mould, allied in some cases to yeast, in others to mould, is communicated by germs in the atmosphere to the cheese, and this it is that gives it its distinguishing flavour.

The Late President Garfield.—Professor Esmarch, the surgeon, has published a lecture which he delivered some months ago before the Physiological Society of Kiel on the treatment of President Garfield's wound. The wound, he maintains, was not mortal, and the injury to the vertebra could have been healed. The death of the patient was mainly caused by the loose way in which the antiseptic treatment was applied. A great mistake, too, was made in searching for the bullet. Had the American surgeons imitated Von Langenbeck's example, who did not attempt to extract any of the pellets when the German Emperor was wounded, and had the antiseptic treatment been rigorously applied, the President might, the Professor maintains, be alive now.

Transit of Venus.—On the 6th of next December the planet Venus will again cross the face of the sun, as in 1874, and no such transit will occur again for over a century. The astronomers of the next hundred and twenty years will therefore be dependent upon the correctness of the observations to be made by their confrères of the present day for much of their data and calculations. The contribution of this country towards this scientific work was made in the form of a vote in the Civil Service estimates.

Werdermann's New Incandescent Lamp.—The peculiarity of this lamp consists in the fact that the vacuum, indispensable in all other such lamps, is dispensed with. Mr. Werdermann employs silicium in place of carbon, and he has succeeded in procuring from it better results than if carbon were employed.

Death of Georges Leclanché.—The death is announced, at the early age of 43, of Georges Leclanché. He was the inventor of the well known Leclanché pile, whose use is probably more widespread than that of any other form of electrical generator. He quitted the service of the Eastern Railway Company about 1867 to devote himself to his researches on the peroxide of manganese piles. His first patent for the porous vase elements is dated 1867; in 1875 new patents were taken for his cylindrical agglomerated plates; in 1876-8 he perfected his new elements of moveable agglomerated plates, at present those most generally in use. If the number of Leclanché's inventions has been small, their success has been as complete as could be wished.

THE SCIENTIFIC REVIEW
AND
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OCTOBER, 1882.

PROGRESS OF INDUSTRY—PATENT LAWS—WORKING MEN—THE PATENT AGENTS.

Although we do not belong to those who consider this country's position to be that of a slide of backward tendency, yet we are by no means satisfied that either as to position or progress we can afford to do otherwise than use all our intelligence and energy in forwarding our manufactures and commerce.

With the views above stated, by natural sequence it follows that to do anything to push forward our *own industrial enterprise* is to act as public spirit and patriotism demands. It is our national manufactures that want reviving; therefore, no mere commercial shuffling of cards under the name of Free Trade, actually pushing foreign workmanship into our markets whilst pretending to give some facility to British manufactures, will be anything but injurious to us, even though the whole range of Political Windbags stand forward in its support.

But before and far beyond such fog raising measures as we have just adverted to, is one that has been so often treated of in our columns that we are almost ashamed to notice it, that is the Patent Law, which naturally has its position as a foundation-stone in the edifice of Industrial Prosperity, for unless the intellect of the country be brought to bear in a practical sense in the matter, how can progress go on? Without inventors or improvers how will progress through intellect be forwarded?

And is the application of intellect to invention and improvement to be restricted to rich men, thus excluding working class intelligence? If so, what a left-handed affair it will be! for working men of intelligence are the great improvers of our mechanism, and many men of the same pecuniary position are great Inventors.

Now the Patent Law professes to encourage Invention, and badly as it is constructed has done some good work, for it has afforded the Inventor some chance of pecuniary return, and has induced capital to develop various important Inventions.

Small Government Patent fees (or as now termed Stamp Duties) and readier and actual protection of Patents should be better provided for by action in the County Court. Let these points keep on pushing themselves before the public and Parliament notice, and the matter will be accomplished. Otherwise the Society of Arts, which thinks only of the classes who pay guineas into its coffers, will carry the day, leaving the work half done. That the workmen have got hold of the right idea the following resolution at the last Trades Union Congress will make manifest:—

Mr. W. J. Davis moved—"That this congress again expresses its strong disapproval of the continuance of the unjust Patent Laws, which tax intellect unduly and act to the disadvantage of the mechanic, who, generally unable to secure the benefits of his inventive capacity, is compelled to remit his right of originality. It also regrets that the President of the Board of Trade has been unable to introduce his promised Patent Bill, and trusts that the Government measure will remove the anomalies of which poor inventors justly complain. And, further, this congress instructs its Parliamentary Committee to watch the Government and private measures, and to use every exertion to obtain equitable provision for all classes of the community." Which no one can object to.

Apropos of Patents, a Patent Agents' Institute has been started. The objects with which the association has been formed include the promotion of improvements in the Patent Laws for the good of *Inventors* of course, and in the regulations under which they are administered, the framing and establishing rules for the observance of Patent Agents in all matters appertaining to their professional practice, extension of their opportunities and facilities for meeting, correspondence, discussion, and inter-changing ideas respecting matters connected with their professional practice, and generally aiding the acquisition and dissemination of knowledge appertaining to their profession.

That the Institute will be in a position to carry out these objects there can be little doubt, for it has received some considerable support in the profession. The first Council consists of Mr. John Henry Johnson (President), Mr. John Imray (Vice-President), and Messrs. Charles Denton Abel, William Brookes, William Carpmael, St. John Vincent Day, Alfred Vincent Newton, George Shaw, William Spence, and William Lloyd Wise. In conclusion, whilst we heartily congratulate these gentlemen on the success they have achieved, we must not omit to mention that the formation of this most important Institute is largely due to the untiring zeal and tact of Mr. G. G. M. Hardingham, who for the present is acting as Honorary Secretary, and whose invaluable services cannot fail to be warmly appreciated by every member of the profession. However, *verbum sap.;* in framing and establishing rules for the daily duties of Patent Agents, they must be careful.

Proceedings of Societies.

ANTHROPOLOGICAL INSTITUTE.

JUNE 13.—General Pitt-Rivers, F.R.S., President, in the chair.—Mr. Mann S. Valentine, of Richmond, exhibited a series of figures carved in stealtite and mica schist, forming part of a large collection found by him in Virginia and North Carolina; the whole collection consists of 2000 specimens consisting of various animals and household utensils, cups, &c., the human beings are all clothed, and are represented riding on animals and sitting on chairs, and indicating a remarkably advanced state of civilisation, and in some instances obvious traces of contact with Europeans.—Mr. A. H. Keane described the district in which the objects had been found, and the tribes that were known to have inhabited that country.—The following papers were read: "Nepotism in Travancore," by the Rev. S. Matur,—"The Laws of Madagascar," by Dr. G. W. Parker,—and "Cummer, Co. Wexford," by G. H. Kinahan, Esq.

JUNE 27.—General Pitt-Rivers, F.R.S., President, in the chair.—Mr. Villiers Stuart, M.P., exhibited and described a drawing of the funeral canopy or tent of an Egyptian queen, and some casts of bas-reliefs discovered by him within a short distance of the tent.—Mr. E. H. Man read a further account of the natives of the Andaman Islands, in which he treated more particularly of their home life; the food and methods of cooking were fully described, also the games, amusements, and dances.—A communication was received from Mr. H. C. R. Becher on some Mexican terra cotta figures found near the ancient pyramids of San Juan Teotihuacan; from a comparison of these figures with those in the Museum at Palermo the author argued that they were produced by people of the same race, and that the builders of the ancient monuments were Phœnicians.

JULY 11.—General Pitt-Rivers, F.R.S., President, in the chair.—Lord Talbot de Malahide read a paper "On the Longevity of the Romans in North Africa." The author gave some instances of epitaphs and inscriptions on tombs of persons whose age had exceeded 100 years, in some cases an age of 120, 130, and even 140 years had been attained. An interesting discussion ensued, in which Mr. Villiers Stuart, M.P., Mr. Moncure Conway, Capt. Cameron, Mr. John Evans, Mr. Francis Galton, Sir Joseph Fayrer, Dr. Allen Thomson, Mr. Carmichael, and the President took part.—Captain R. F. Burton read a paper "On some Neolithic Stone Implements and other objects brought by himself and Captain Cameron from Wásá, on the Gold Coast." A large number of objects were exhibited by the authors and Mr. Ross.—General Pitt-Rivers read a paper "On the Egyptian Boomerang," and exhibited several specimens.—A large collection of Bushman Drawings was exhibited by Mr. M. Hutchinson.

ARCHÆOLOGICAL INSTITUTE.

JULY 6.—Lord Talbot de Malahide, President, in the chair.—The Rev. W. Loftie read a paper and offered some observations upon the hawk sacred to Chonsu, with special reference to Rameses XII. and Raneferoo his queen, and described the manner in which the various towns of Egypt favoured the worship of different animals, and the high favour in which the hawk was held, evident, indeed, as the noble Chairman observed, at the present day.—Mr. W. Brailsford read a paper on the monuments of the Seymours at Great Bedwyn, Wilts, which included a notice of the remarkable and lengthy inscription on the tomb of Sir John Seymour, the father of Edward, Duke of Somerset, and Jane Seymour, and who died in 1536.—Prof. B. Lewis read a paper "On the Antiquities of Autun, the Capital of the Ædui of Cicero," giving an eloquent and exhaustive account of the treasures in the Musée Lapidaire, including the famous Christian epitaph, the ceramic inscriptions, the architectural peculiarities of the cathedral, the Roman gates, &c. Prof. Lewis stated that, according to the best authorities, Bibracte was situated not at Autun, but on Mont Beuvray; this Gallic Oppidum included within its ramparts three plateau, Le Terrasse, Le Parc aux Chevaux, and Le Champlain, separated by three valleys, La Goute Dampierre, L'Ecluse, and La Corne Chaudron. In ancient times La Terrasse was the most important locality, as it contained the Temple and the Forum. On the other hand, La Corne Chaudron is the most amusing to us, on account of M. Bulliot's discoveries, which throw much light on the art of working on metal as practised by the Gauls, and more especially on their processes of enamelling. Prof. Lewis further expressed a hope that English antiquaries might be induced to deviate from the beaten path of tourists, and see for themselves the results of the "Fouilles du Mont Beuvray."—Capt. E. Hoare read some notes on a sepulchral statuette, which he exhibited, of an hereditary lord and landowner, of a very rare type, *circa* 1000 B.C.—Mr. H. R. H. Gosselin laid before the meeting some fourteenth century tiles from Bengeo Church, Herts. The Chairman made some observations on the Roman remains and other antiquities in Algeria, and exhibited some flint celts and several early antiquities from that country.

DISCOVERY OF A NATURAL GROTTO.—A Naples correspondent writes:—Near Dorgati, in Sardinia, a short distance from the coast, there has been discovered a natural grotto, surpassing in beauty the celebrated Grotto of Neptune in the same island. The great want of water felt in Sardinia this year induced three young peasants to venture into a deep ravine in the hope of finding water at the bottom. The opening of this ravine had been always closed with branches of trees in order to prevent the goats from falling into it. It was now uncovered, and the youths descended by means of a cord. When they arrived at the bottom they found no water, but on lighting torches were surprised to find an immense grotto with stupendous columns of stalactite. They returned a second time, and found 15 magnificent natural galleries, which were speedily visited by the citizens of Dorgati, and the grotto surnamed the Arcipreto, which is the name of the young peasant who descended first. The grotto can be reached by sea in about half an hour from a place called Gonone. The ingress is difficult, and it is necessary to lay down oars so as to make a sort of staircase. The 15 galleries extend over a space of about 500 square metres. At about the middle of the first gallery there is a deep chasm leading to another grotto, which has not yet been examined. The gentleman who wrote an account of his visit to the grotto in the *Avvenvic di Sardigna*, says that for three hours he met with new surprises—now discovering a pavement that seemed composed of the finest basalt—now a colonnade of marble, now lofty vaults like the dome of a church, now figures resembling an infant, or a candelabrum, or a gun, or a pulpit, or a richly-embroidered throne. Sometimes a chapel, at others a mausoleum. Such the freaks of nature. Illuminated by candles and torches the grotto assumes the most varied tints and the most fantastic combinations. An infinity of labyrinths lead from one gallery to the other. The very smallest quantity of water trickles in one place. In the third gallery, among a piece of crystallisation about half an inch thick, is the perfect imprint of a human foot. The grotto opens towards the east, and is 80 metres above the level of the sea, lying almost directly over the noted "Grotto of the Seals."

ONLY ONE SENSE.

(*Concluded.*)

LET us next glance at the faculty of sight. When we find that an excess of light produces in the eye a great degree of disturbance and pain, we are perfectly justified in considering the eye, like the ear, as a receptive organ. Really it is easier in this case to prove this to ourselves; for experience shows us that the less there is of light, the less we can see, and we feel well assured that if there were no light (and it were possible to exist without light), we should not be able to see at all, and that the organs of sight would cease to have a use. This is shown very clearly in some of the underground lakes and rivers of America, which have been in darkness for ages, and where, as a consequence, the fishes and other forms of animal life dwelling therein are destitute of eyes; although they have the rudiments thereof still left, as relics of the time when their progenitors dwelt in the outer light.

What is called the Newtonian theory of light, viz., that the light is a substance which travels from the sun to the earth, has been long since abandoned; although it would in no way affect our argument if the Newtonian theory were the true one.

The now almost universally accepted theory of light is one, which is in every way analogous to sound, viz., that light, like sound, is a certain activity or vibration of particles of material substance, with this difference, that when the phenomenon of light takes place, or is produced, the vibratory particles are not those of the atmosphere, for the reason that the atmosphere *impedes* the light in proportion to its density, and what we usually term a vacuum seem to offer no obstruction whatever. Our philosophers give to this substance, the particles of which, in motion, produce in our case, and presumably in the case of all animal life, the phenomenon called light, the name of luminous ether. It is no part of our purpose to enter into the great question of light, other than to show that whatever particles are in vibration or motion to produce the phenomenon of light, these particles impinge upon the organ of sight, set up a corresponding vibration therein, which is in turn conveyed in the same manner by the nerves to the brain, and consciousness of the whole nervous system, as in the case of the ear with sound. And if these particles impinge on the eye with too great violence, the result is pain: so that in this case also, we may say that the eye is an organ wherewith we feel the vibrations or activities of certain material particles; and this is equally applicable whether light is produced by the vibration, or by the actual transit of those particles.

Let us now turn to the faculty of smelling. As to have a correct idea of hearing and seeing, we must depend upon the investigations into sound and light, so in the case of smelling we must get some correct notion of scents.

We do not know that anything is more clearly established than, when a flower or any substance gives off a scent, it is giving off a portion of its own material in some form or other, which would, if nothing else intervened, and given time enough, reduce the original substance to much smaller proportions. When these particles are allowed to enter the nostrils, they set up, by impingement, a certain particular vibration of numerous and delicate organs, which, by means of suitable nerves, convey similar vibrations to the brain. Here, again, we have an organ wherewith we are enabled to feel the motion or vibration of certain material particles of gases, and other substances. In the case of smelling, we have the same results of excess producing pain; as may be instanced by some of those elegant scents used by the ladies, with such pleasure to themselves, and sometimes (but not always) to others. If these same scents were used in a concentrated form, the result would not only be painful, but exceedingly unpleasant.

We now come to the faculty of taste. And here, although how or why the phenomenon takes place may be difficult to see; yet, on the other hand, we have in this case the obvious fact before us that taste comes by the feeling of a substance with the tongue or palate. But how can we distinguish different tastes? By a similar method to that wherewith we distinguish different sounds. As a certain number of vibrations of a wire always gives the same sound under the same conditions, when such vibrations are felt by the ear; so a certain number of vibrations of another kind, when felt by the tongue or palate, produces, under the same conditions, always the same taste; and in both cases every variation in the rate of vibration produces a correspondingly varied result. The same thing occurs with sight, wherein the different variations of vibration of other particles felt by the eye produces a correspondingly varied colour. The same thing also occurs with smell, wherein the different rates of vibration of the particles of gases, &c., give us the impression of different scents.

We next come to the faculty of touch. But as this is avowedly of a mechanical character, it will not be required, to prove this faculty to be feeling. It, therefore, would seem to follow that those faculties which are commonly called senses are all so many different methods of exercising the one all-pervading sense of feeling or touch.

Now, it may occur to some to ask—if this is so, why should not one organ perform the whole work, seeing that it is touch or feeling in every case?

In answer to that we will refer to an illustration which will commend itself to the minds of all who are engaged on mechanical engineering. The millwright and engine builder require to turn shafts and wheels of gigantic size in their lathes. They build ponderous tools to suit their purpose. The watchmaker also requires to turn wheels and shafts exactly in the same way, and by the same means, mechanically considered, as in the former case. But see what a different class of machinery the watchmaker uses, although the kind of work done is turning in a lathe in both cases.

Again, let us suppose a floor covered entirely with cannon shot, placed side by side as closely as possible; there would be a large amount of space unoccupied between them, in consequence of the spherical shape thereof. We will now suppose we fill up the spaces with small balls; they would still have unoccupied spaces between them, in which we could place marbles. These, in turn, would leave still smaller spaces, which would allow of being filled with small seeds, and the yet smaller spaces, formed by the seeds, would find room for grains of sand. Now, the feet or hands are capable of touch or feeling in a certain manner, but if we were to walk over such a floor, the feet would only be able to touch or feel the cannon shot. If we had long fingers we could touch therewith the small balls; but we should require longer and thinner ones to be able to touch the marbles, and still more lengthened and attenuated ones to feel or touch the small seeds; while nothing short of very long and delicate tentacles would be required to enable us to touch the grains of sand.

Now, if we had such a development of faculties for such a purpose, we should, doubtless, give each a different name, and consider it a different sense, just as we have been in the habit of doing with our various organs of feeling or touch.

We take it that there is, relatively, between the size of the molecules of the atmosphere and the atom of ether (which we personally are inclined to think may be the ultimate atom in a free condition), as much difference, if not more, as a matter of comparison, as between our supposed cannon shot and the grain of sand. And we would be inclined to a very large cannon shot indeed.

So it is with our various organs of feeling. They are constructed to feel different objects, and are designed suitable to the end in view.

Here the question arises, are there then sounds, lights, tastes, scents, or other activities which, when brought in juxtaposition with our organs of feeling, find no corresponding rate or quality of vibration, and so are impossible of our comprehension? Of this fact we have no doubt whatever; it has been clearly proved. Take, for example, the following with regard to sound:—The human ear, in the highest state of cultivation or development, is only capable of comprehending between eleven and twelve octaves of notes. This has been established by many beautiful experiments, and may be explained this way. Suppose a wire stretched to such a degree that when struck with the hammer it gives a note three octaves above the highest note in a modern piano. A very high and shrill note would be heard by most persons. Now, suppose it screwed three notes higher, very few people would hear it, the remainder would not hear any sound at all. We will now suppose the wire to be further tightened until, by counting the vibrations, we could tell that the note produced would be four notes still higher. Then the result to all of us would be the same as if the wire were not struck at all, and there would be, as far as we are concerned, silence. The same thing occurs as we go downwards in the scale. In a similar way it may be shown that there are vibrations of taste, which the tongue or palate have not now the capacity to realise. With regard to sight, who has not proved the superiority of light over his capacity of reception, when he has tried to look at the sun? And though in this case it is sheer excess of force, or quantity, and is analogous to the effect on the ear of a contiguous explosion, still the great facts of spectrum analysis on the one hand and colour blindness on the other, lead us to the conception of forces and activities of which we have no sensation.

We are thus brought clearly to comprehend that there are vast energies surrounding us, of which we can have no comprehension or sensibility. And why? Simply because we have no organs wherewith to feel them in any way, and thus convey the impression of their existence to our brain and consciousness; and further, it is probable that our brains have not the capacity of reception even if the organs existed.

The result of this reasoning is, then, that all the different phenomena which we call seeing, hearing, smelling, tasting, and feeling, are dependent for their existence on the possession of the corresponding organ, by means of which they become known to us, or, so to say, created; in short, that they are so many subjective impressions, and not the objective realities we mostly have supposed them to be. We are free to confess this may sound startling. But let us examine it awhile, and to do so we will go back to what we had to say with regard to sound, and reflect that if the vibration of the particles of atmosphere produce sound by striking or impinging upon the drum of the ear, that it is not sound until it *does* strike thereon, and that if there were *no ears in existence, there would be no sound;* and further if we had in lieu of ears, a new organ wherewith to feel that same vibration of the atmospheric particles, but in a different way, we should have apparently a new phenomenon created, although the operation or motion of those particles producing these results would be exactly the same in both cases.

The objective realities would seem then to be, that there are certain movements or activities of particles of matter constantly going on around us, and that we have an organ called the ear, wherewith we are enabled to feel some of those movements, and that the knowledge of this motion is conveyed to us by means of a subjective impression, which we, to distinguish it from other impressions, have called sound, and we have called the act of receiving this impression, hearing.

With regard to sight, we think there is one well-known experiment which will clearly demonstrate that the phenomenon we observe in ourselves is a subjective impression entirely. We refer to the interception of the sun's rays by means of a prism.

To the ordinary eye, light appears white in colour; but if we place between the eye and the light a glass prism, we have as a result a condition of things wherein this same light presents itself to the eye with all the colours of the rainbow. Now if we suppose the eye as a kind of prism or other instrument for the interception of certain forces, we see that upon the nature of this instrument will depend the effect produced on the brain. We at once also perceive that as the forces of vibration of the atmosphere only become converted into sound by the ear, so the forces of vibration of other particles only become converted into light upon coming in contact with the eye; or that, in other words, *without eyes there would not be light, as such.* But that the objective reality of light is simply the activity of certain particles, which, with our organs of sight, produce, to our sensibility, certain impressions which vary with our capacity of reception, and other conditions.

Yet, considering what enormous activities exist in the universe, how little we have comprehension of those activities which, to our consciousness, present themselves in the form of sound and light! Modern astronomical and spectro-analytical research have made us familiar with the intense outbursts of forces from the sun, which, whether considered in the form of sound, light, or heat, would be such (at the sun's surface) as to reduce everything on this earth probably to gases. What, then, must be the condition of Sirius, or the forces emitted by him, who is estimated to be 8000 times larger than our sun. And there is now no doubt that such stars as Rigel, Antares, Vega, Arcturus, Altair, Betelgeux, and Aldebaran far outshine even Sirius. Of course, as at present constituted, we could not live a moment under such an intense blaze of light as a near approach to these wondrous centres would involve. It is sheer distance which softens the forces of this vast light, heat, or motion to us. We have very little idea of these distances. An express train constantly going would only reach the sun in between two and three hundred years, and would take nine years to travel round it when it got there; well now, Alpha Centauri, the *nearest fixed star,* so far as we know, could only be reached in the same way in between 40 and 50 millions of years. 61 of the Swan is somewhere about double the distance of Alpha Centauri, and so would take little short of 100 millions of years to be reached by an express railway train. And yet these are comparatively near suns. Thus we see how it is the enormous forces exerted by these great centres are so softened down, until organs such as ours are able to receive and transmit their impressions.

We think by this time most will be ready to admit that smells or odours are mere subjective impressions; indeed there is a very familiar proof of this. When we suffer from cold or catarrh we find our organ of smell so deranged that things—the smell of which we well know—convey to us a different and entirely new scent from that which is their wont. There seems to be a very near approach to each other, or assimilation, so to speak, of the two organs of smell and taste, for this same cause of derangement of the one is often at the same time a derangement of the other, and with very similar results.

What then is the final conclusion of this reasoning? It is to show that the only real sense we have is that of feeling, and that what we call the other senses are simply other methods of feeling by means of different organs, suitable to the different objects we require to know, so that we may obtain sensations pleasurable and otherwise. Yet, as after we learnt that it was the earth which moved round the sun to make day and night, we still spoke of the sun rising and setting, as if such were really the case, for the sake of convenience: so in this case shall we necessarily continue to apply the same phraseology we have been accustomed to, when speaking of our different organs of feeling. But we do so with the advantage of a higher knowledge which renders a change of language entirely unnecessary. We know full well that the question arises, and we may have already suggested it, namely, What then is feeling, and how is the phenomenon manifested to any organs of our sense? Well, having led up to this point we prefer to postpone to a future time the consideration of the difficulty, especially as it involves much which is at present doubtful and obscure; and at the same time it is outside the field of enquiry we had proposed to ourselves in this article.

This much we can be sure of; that we have a variety of organs for feeling in a variety of different ways, some of the different effects of the action of many substances; and that the more these organs are multiplied and perfected, or extended in range and capacity, the higher order of created beings we realize; and which, when added to a nervous organism or system, such as we find in man, gives great and wonderful capacity for both pleasure and pain, and a great degree of every sensation, yet limited to his needs. And this is wise, Everything is designed to the use required, habitually, of it. And the variety of our organs, wherewith we *feel* for assistance amongst the different substances surrounding us show, or should show to us, that wondrous and infinite wisdom and love which so shapes our capacity to our needs; which has laid down from all eternity those universal laws, which, as the circumstances surrounding us change, tend at once to fashion and alter our very nature, so that there is established perpetual harmony between all forms of matter. Thus, when we contemplate this wonderful, harmonious, and self-acting mechanism, we are constrained to fall down and worship, and with our heads in the dust exclaim, Great and Wonderful!

A New Narcotic.—Dr. Schomburgh, the learned director of the South Australian Botanic Gardens at Adelaide, in his annual report on the valuable institution which owes its existence to his unceasing care, describes a new narcotic, which the aborigines of Australia indulge in freely. The leaves of a plant called the *Duboisia Pituri*, which grows in the interior of the island continent, from Cooper's Creek to the Gulf of Carpenteria, possess, when dried and chewed or smoked, properties akin to those of opium or tobacco, and probably about half way between the two so far as potency is concerned. The natives who find the plant growing in their country, trade far and wide with other tribes, who are only too anxious to possess themselves of the means of indulging in the delightful dreamy sensation which the plant produces. The active agent is a volatile alcohol similar to nicotine, which has been called "piturine." The immorality of the drug will perhaps be somewhat redeemed when we add that this piturine has already been found to be a potent remedy in ophthalmic practice in Europe.

THE AMERICAN TAX ON LITERATURE.

That a people recognising so thoroughly as the Americans the advantages of liberty and of knowledge should maintain a 25 per cent *ad valorem* duty upon all foreign books and other printed matter entering their country is, to say the least, an anomaly, and recently the lowering of the exemption value from 4 dols. to 50 cents has caused still greater annoyance to those upon whom the impost falls. The result is an agitation for the total abolition of the duty, and—if the few who live by the dishonest practice of reprinting foreign books without paying the authors or publishers of them be excepted—it may truly be said that the opinion in favour of the removal of the tax is unanimous. It is not asked that American reprinters should be forbidden—if the Divine Commandment does not prick their consciences—to steal the works of foreigners; but merely that when they steal they shall share the plunder with the community generally, and let every American reader have his books at least as cheaply as they were issued in the country in which they were created.

By the vast majority of Americans the book duty is considered unwise, but American publishers occupy an altogether lower social scale, if social rank is to be determined by the amount of justice and intelligence exhibited. One of them—Mr. H. O. Houghton, of Houghton, and Mifflin, of Boston,—has been seeking to propagate a system of logic of his own which puts Aristotle, Whately, Aldrich, and men of that class entirely in the shade. Mr. Houghton thinks that if the 25 per cent *ad valorem* duty on books be interfered with American authors will reside in England or in Germany in order to be able to manufacture their books more cheaply, that by their residence in Europe their modes of thought will be so Europeanised that they will teach principles of politics and religion and modes of thought alien to the theory of American institutions. The influence of "the mighty dollar" in America has often been heard of in England, but it was left for Mr. Houghton to teach Englishmen that the abolition of the 25 per cent *ad valorem* duty on foreign books would cause an American to change his politics and his religion.

So long as there is no international copyright between England and America the retention or the abolition of the foreign book duty will really affect Englishmen, whether authors or publishers, very little; and if Mr. Houghton really be justified in declaring foreign thought to be deleterious to American institutions it would appear to be a case parallel to that of George Stephenson's locomotive and the cow—"so much the worse for the 'coo.'" Happily, however, Mr. Houghton's view is merely that of an interested protectionist, and when he has more wisdom he will learn that the true remedy is not to exclude foreign knowledge from the United States, but to so improve the system of higher education that it shall be unnecessary for so high an authority as President Barnard, of Columbia College, New York, to have to acknowledge that with a few honourable exceptions the American "Universities" differ "only in name from schools for children of tender age." The abolition of the foreign book duty will be of greater advantage to Americans than to any one else.

Mr. Gordon Dinsmoor, of Kirksville, Mo., has recently patented improvements in *school desks*. The improvement consists of a foot rest sliding in grooves in the desk frame, and connected with the front edge of the hinged seat, whereby the hinged seat and the foot rest are simultaneously raised and lowered. By this construction a foot rest is provided that cannot be removed by the janitor, and when the seat is raised is out of the way of the broom in sweeping.

RECENT AMERICAN AND FOREIGN PATENTS.

Mr. Edmond A. G. D'Argy, of Paris, France, has patented an improvement in the class of *cigarette wrappers* which are provided with a moisture-proof coating at one end; and it consists in constructing the wrapper and coated end or portion in one single piece, and in such manner that the wrappers shall be conveniently adapted for being put up in packages for use in making cigarettes at the convenience of the smoker. A cigarette paper which is made saliva-proof before being applied as a wrapper is adapted for making a better cigarette wrapper than can be made by applying a saliva-proof coating after the cigarette is made, since in the latter case the coating is liable to close the end of the cigarette, and, owing to the fact that the coating cannot then be applied to the folded part of the wrapper, the protection thus sought cannot be secured so well as where the paper is prepared in the manner above described; and it is well known that the manufacture of cigarettes with a waterproof coating according to the usual methods has been found impracticable.

A flaxseed cleaner has been patented by Mr. George Beal, of Gilman, Iowa. This invention relates to machines for screening flaxseed for the separation of chaff and other impurities. In operation the screen is in a horizontal or slightly inclined position. The material is to be fed by a spout to the screen surface, and during the screening operation a body of material will be on the screen and be worked gradually toward the delivery end. The smaller particles—such as mustard and foxtail seeds—pass through screen and escape; the flaxseed pass through another screen and out at another opening, and the remaining material passes off by a separate spout. The material is supplied to the screen at a uniform rate, and moves forward slowly at a speed regulated by the rapidity and extent of vibration. This insures effective and thorough separation.

A tyre cooler has been patented by Mrs. Dora Ammerman, Thomas Baird, and Ebenezer M. Foreman, of Fairmount, Ill. This invention consists of a suitable wheel supporting rack or bed fixed on connected rocking bars of novel design within a water box in such a manner that the wheel rack can be elevated or depressed at will by means of a lever, whereby a wheel, with its heated tire, may be plunged into and raised out of the water in the said box, and the tire thereby quickly and evenly cooled.

Broom and scoop mechanism for evaporating pans has been patented by Mr. Carl F. W. Schramm, of Brooklyn, N. Y. The object of this invention is to facilitate removing crystals and other solid matter from evaporating pans, such as are used in the manufacture of soda and other substances. It consists in a brush or scoop mounted on the ends of arms of a revolving shaft journaled above an evaporating pan in such a matter that when the shaft revolves, the brush and scoop will be caused to sweep over the interior surface of the pan and remove the solid matter on the bottom of the pan into a suitable receptacle that is arranged outside of the pan.

A Substitute for Earthenware—P. Dodé in Paris, manufactures tiles, pipes, architectural ornaments, pavements, mantels, &c., from a new material made as follows:—Some difficultly fusible stuff like sand, or pulverised porcelain, is mixed with powdered glass and a little water. This mass is then made into balls or plates and heated until the glass softens, when it is pressed into the desired shape and cooled. For the mixture 100 lb. of very finely pulverised glass is mixed with 500 lb. of sand, and some metallic oxide added to impart the desired colour; it is very thoroughly incorporated with the aid of a little water to make it plastic. The slabs or balls formed from it are placed on plates of refractory clay, and run into a furnace provided with little trucks like the tempering furnaces of a glass house. When the glass is softened the balls are put into metallic moulds provided with a stamp or piston, which falls as often as the finished article is taken out and fresh material put in, which takes about five or six seconds. The quantity and quality of the glass employed is varied according to the fusibility of the other constituent employed in each case. If very finely pulverised porcelain is employed instead of sand, then the ware obtained will closely resemble porcelain. As the glass is only softened, not entirely melted, it will probably be found possible to combine several colours in a single object and to produce various other curious and novel effects. Nothing is said in regard, however, to the possibility of decorating the articles before or after passing, or as to the effect of etching and grinding.

Mill.—Mr. William C. Salmon, of Portland, Ore., has patented an improved mill for pulverising ores, cements, bones, and other substances, The mill is constructed with a vessel having a central projection on its bottom, forming a ring chamber, a sectional ring die in the bottom of the ring chamber, and screen-covered openings in its sides for the escape of the pulp, and a ring-shaped pulveriser having radial dies upon its lower side, which work on the ring die. The driving mechanism connected with the pulveriser gives it a wabbling movement. Guide blocks attached to the central projection of the vessel insure the centering of the pulveriser.

Mr. William S. Parker, of New York city, has patented a *dynamo-electric machine* in which the heating produced by induced magnetism in the bars of the armatures is greatly reduced. The armature consists of a shaft to which are attached circular heads, and to the edges of the heads at equal distances are secured bars of soft iron provided at each side with flanges, the flanges forming the poles of the armature magnets. The armature bars are wound lengthwise, and the wire is retained by the flanges. Spaces are left in the flanges at suitable intervals for the air to circulate freely, and the spaces also serve to prevent the circulation of currents. The pole blocks of the machine are cast and fitted on their faces with bars of soft iron, the soft iron being more easily magnetised, and inducing a more powerful action in the machine.

Mr. Thomas Bower, of Waterburg, N.Y., has patented improvements in *tree protectors*. The protector consists of a series of upright slats, that are spaced to admit light and air, and held together by elastic bands. These slats encircle the tree for a limited distance from the ground, and terminate at their ends in outwardly bent barbed extensions, and may be made wholly of iron or steel, or partly of wood, and the bent portions of metal.

An improved *earth closet* has been patented by Mr. Henry J. Behrens, of New York city. The seat is attached to the inner side of the wall of the closet, and above the seat on the outer surface of the wall is attached a hopper, having in its upper part a sliding sieve, that has a handle for reciprocating it. The bottom of this hopper is closed by a slat fastened on the top of a hopper that is hinged to the bottom of the seat, and supported by a weight in a vertical position under the upper hopper. A rod attached to the hopper for moving it projects from the seat. By suitably arranged devices, ashes placed in the upper receptacle are let down in small quantities to the swinging hopper, and when the rod is pulled the hopper is inverted and the ashes fall to cover the excrements in the pit under the seat.

Mr. George W. Dudley, of Waynesborough, Va., has patented an improvement in *reamers*. The reamer is first made in the shape of a square in cross section and having the proper amount of taper, and grooves are then cut on one side of each of its corners, and the whole piece is then twisted to form a spiral cutting edge. In giving the twist the reamer is turned upon its longitudinal axis, so that its spirals wind in a reverse direction to the ordinary gimlet. This reamer cuts at all points in its circumference at the same time and makes a perfectly round hole, and will not choke, as it drives the cuttings before it.

An invention to prevent the escape of grounds when pouring coffee from coffee pots has been patented by Mr. John Mc Anespey, of Philadelphia, Pa. In the inside of the coffee pot is an upright, finely perforated in its upper part, and secured to the sides of the port in such a position as to cover the hole leading to the spout. When the pot is inclined to pour out coffee the grounds are kept back, by the solid lower part of the plate, while the coffee passes through the perforations of the plate and out at the spout, free from grounds.

Mr. William E. Harris, of New York city, has patented improvements in the process of *extracting gold from ores*. The ore, after being roasted and chloridised, is then placed in amalgamator pans, and mixed with bromide of sodium in the proportion of two pounds of bromide to a ton of ore. Water and quicksilver are then added, to produce a proper amalgamation of the metal, and the amalgamation is run about three hours, and the pulp is discharged through separators. The bromide of sodium prevents the sulphates and chlorides from attacking the quicksilver.

An invention to facilitate the reversing of windows for cleaning them from the inside has been patented by Mr. Henry Becker, of New York city. The upper half of the window jambs are adapted to swing on pivots, and the lower sash is raised until it is within the swinging frame and is locked in this position. Both sashes are then inverted by turning the swinging frame half way over. By this means the outsides of the sashes are turned to the inside and may be cleaned by a person inside the room, avoiding the danger from cleaning from the outside.

Prevention of nuts of rail bolts from being loosened by continued vibrations has been patented by Mr. Walter B. Johnson, of Waterloo, Ind. A metal strip that will fit between two adjoining nuts is riveted to the outer surface of a washer plate, and is held a short distance from this plate by a small block. The bolts of the nuts to be locked pass through the fish plates and rail, and rubber washers interposed between the washer plate and the fish plate. The ends of the metallic strip are then pressed against the washer plate, and the nuts are firmly screwed on the rail bolts, and the ends of the strip are then drawn outward, so that it will be straightened. If the nuts loosen they will strike against the ends of the strips and the rotation will be prevented.

An improved *car coupling* has been patented by Mr. Sylvester Oar, of Kansas, Ill. A transverse rock shaft is journaled in boxes on the end of the car, and is provided with collars on the outside of the boxes. The outer ends of the shafts are bent to form handles, and a spiral spring is placed on the rock shaft between one of the boxes, and an arm that projects from the shaft. The projecting arm, when the rock shaft is turned up, engages with a catch on the end of the car. To the under side of this arm is attached a curved arm, and into the slot between the arms projects a pin that is secured to one side of the coupling link that is pivoted on top of drawhead. The outer end of the arm is attached to a rod that passes through an eye secured to the end of the car. Hooks that engage with the outer end of the coupling link are attached to the upper side of the drawboards. By means of the rods and handles at the end of the cars they may be coupled or uncoupled either from their top or sides.

Car coupling.—Mr. Charles P. Williams, of Summit Point, W. Va., has patented a car coupling adapted to be operated from either side of the car. The drawhead of the car is of the ordinary construction, and has a cross head, that is formed of two partially closed chambers that communicate with the interior of the drawhead by means of apertures through which a coupling pin passes. This pin has an arrow head at each end, by means of which a catch engages to withdraw the pin from the coupling link. The catch is pivoted to the inner end of a rod that projects through the crosshead. This rod has a spring coiled about it which has sufficient force to hold the catch against the drawhead, and cause the catch which is beveled at the end to be raised through an opening in the top of the crosshead, which opening is so constructed, that when the catch is drawn back it will engage with the neck of the pin. Underneath the crosshead on each side is fulcrumed a lever which is used to lift the coupling bar so that it will properly engage to couple the cars. The coupling bar is of the arrow head form.

Brakes.—Mr. James B Bray, of Waverly, N.Y., has patented an improved car brake, of that class in which all the brakes of the train are applied from the locomotive by means of a steam piston acting upon buffer rods extending the whole length of the cars, and it consists in running short stiff buffer rods through the trucks at each end of the car, and connecting these short buffer rods directly to the brake beams by springs, then joining the two inner rods of the short buffer rods to form a continuous connection by means of a traction rod running from truck to truck of the car, which traction rod is at each outer end connected to the inner ends of the buffer rods through a lever.

Electro Magnetic Motors.—An invention, by which the loss of power resulting from the rapid reciprocating movement in electro-magnetic motors in which the vibration of armatures is utilized for power is avoided, was recently patented by Mr. John Du Bois Kiely, of Toronto, Canada. An endless belt extends around rollers and through the magnets, and has cylindrical armatures attached to it at regular intervals. The armatures are slightly longer than the distance between the magnets, and the space between them is equal to twice their length. The belt rollers are fast on their shafts, one of which carries also a balance wheel. The rollers are flattened on two opposite sides to receive the armatures and to prevent slipping. Each magnet is provided with a circuit closer, consisting of a bell-crank lever, one end of which projects into the path of the armature, so that when pressed down by the advancing armature the lever closes the circuit to the magnet next in advance. This occurs when the armature has passed the point of maximum attraction in one magnet and broken the circuit by its rear end clearing the lever. The armature belt is moved by a draught acting continuously in one direction of the armatures, thus avoiding changes of direction and utilizing the momentum.

Measurer.—Mr. Rudolf Wittman, of New York city, has patented an improved device for rapidly and accurately measuring dimensions, such as curved and right lines. The dividers have the usual legs. A circular casing attached to the joint piece of the dividers contains a dial whose circumference is divided into any number of parts. This dial is connected by a train of cogwheels of equal size, with a tracing wheel of the same size and number of teeth pivoted to a projection of the casing. One revolution of this wheel corresponds with one revotion of the dial. A cogwheel having one tooth more than the wheels of the train engages with one of these wheels, and is provided with a pointer which passes through the centre of the dial and revolves over its face. The casing is also provided with a rigid pointer extending from the middle of the dial to its edge. To measure a curved or right line, the instrument is inverted and the tracing wheel is rolled along the line to be measured, the dimension being given by the pointer on the face of the dial.

Oscillating rotative engine.—A new mechanical movement, designed to convert an oscillating movement into a rotary movement in a single direction, and to take the place of a ratchet and pawl mechanism, has been patented by Mr. James B. Bray, of Waverly, N.Y. A rotary shaft carries a gear wheel between two frame plates. A swinging frame is hung loosely on the shaft and carries a pinion arranged to mesh with the main gear wheel. Upon each side of the swinging plate, on fixed bearings in the frame plates, are loose pinions that mesh with the main gear wheel. When the swinging frame is moved toward one pinion its pinion meshes both with the pinion on the frame plates and with the main gear wheel. All these wheels are locked together, so that when the swinging frame is moved forward it acts as a rigid lever on the shaft to turn it. When the frame is thrown in the opposite direction the diretion of the movement of the shaft is reversed.

Oarlocks.—Mr. Samuel Irwin, of Lindsay, Canada, has patented an improved oarlock, by which the person rowing is enabled to face in the direction the boat is being propelled, thus facilitating the steering. The handle and blade sections of the oar are divided and firmly fixed in sockets formed with toothed segments at their ends that mesh into each other, and are fulcrumed between two plates which are held firmly together. When the handle section of the oar is pulled towards the rower the blade section will move in the same direction and propel the boat forward. To allow the necessary motion to the oar to permit it to enter and leave the water the fulcrum box has trunnions which rest in bearings secured to the gunwale plate of the boat.

Sheeprack and trough.—Among recent inventions we find a combined sheep rack and trough patented by Mr. Amer R. Yost, of Somerset, O. The base of the rack is of box form, open at the top, and provided with four corner posts. To the corner posts of the sides of the sides of the box are pivoted the lower bars of racks, adapted to swing toward, or from each other, and the box is covered by a rack bottom that may be revolved to clean out the box. To the end posts of the rack and between their sides is pivoted a swinging end gate that is held from swinging by a pin. By this construction the end racks may be swung up and the rack bottoms removed. To the corner posts are also pivoted arms the outer ends of which are provided with an angular trough for feeding grain to stock, and the racks when swung upward form a wedge-shaped space for the hay, the feeding troughs serving as a support for the rack.

Corn planter.—Mr. John Feldmier, of Oekaloosa, Kan., has patented a corn planter of the class in which the dropping mechanism is operated by a knotted wire or rope stretched across the field, and by means of which the rows are properly check-rowed. The machine is supported on two wheels connected by an axle, to which is attached at the inner sides of the wheels two transverse bars. To these bars are pivoted side hoppers, connected by a crossbar attached to runners that open channels to receive the seeds which passes from the spouts of the hoppers, and as soil falls back into its place it is pressed down by a wheel. To the centre of the machine is attached a tongue, to which are pivoted two parallel bars carrying a central hopper provided with a runner in front and a wheel behind for preparing the soil and covering the seed. A three-armed plate is pivoted at its centre to the cross bar, and to one of its arms is pivoted the seed dropping slides of the side hoppers, and to the second arm of the lever is pivoted the dropping slide of the centre hopper, so that the seed will be dropped simultaneously from all the hoppers. The third arm of the lever is pivoted to a rod operated by the knotted check rope.

Cleaning grain of all light impurities by means of friction and the blast of air which results from its passage down a steeply inclined pipe, has been patented by Mr. Sewall Truax, of Walla Walla, Washing Ter. It consists of two or more steeply inclined chutes arranged below each other, and connected by a vertical chamber. The grain passes from a hopper and is distributed over a screen which removes the coarser refuse and falls upon a fine screen. From this screen it is discharged into cups attached to a belt, its weight turning the belt cylinders, on each end of which are ratchets that jar the screens. When discharged from the cups the grain passes rapidly down until it is diverted from its course into an upright pipe by an adjustable slide. The velocity of the grain creates a strong upward blast, which carries with it all light impurities, while the clean grain falls to the bottom and is carried to the receiver.

An improved *fanning mill* has recently been patented by Mr. Johnathan D. Bush, of Lebanon, Mo. The fanning mill is of ordinary construction in the frame, casing, fans, and fan shaft, with the connecting gear and crank. To the outer end of the fan shaft is attached a crank, the pin of which passes through a longitudinal slot in a horizontal arm of a right angle lever that is pivoted at its bend to a post on the outer surface of the casing. The lower end of the vertical arm of the bent lever is slotted to receive a pin secured to the end of a lever that passes through the casing and extends across the mill and is pivoted to the opposite side. An arm projects from the forward side of this lever which is slotted at its outer end to receive a pin attached to the cross bar of the upper sieve shoe, and by this construction the upper sieves receive a vibratory motion. To the under side of the lever, near its centre, is attached the shoe of the lower sieves, so that the shoe will be reciprocated by the vibration of the lever.

An improved *mowing machine* has been patented by Mr. William M. Webber, of Ravenswood, W. Va. The driving wheels and axle of the mower are of the ordinary construction. A rectangular frame is pivoted to the axle, and to this frame is secured the seat and tongue, and between its sides is an auxiliary rectangular frame that is pivoted at its front end to the axle and its rear end extends beyond the main frame. A cone pulley fixed to the axle of the driving wheels, and a similar pulley of less diameter, is journaled in the sides of the auxiliary frame, the pulleys being connected by a belt. To the end of the small pulley shaft, opposite the pulley, is attached a universal joint. To arms attached to the main and auxiliary frames are hinged corresponding arms of a swinging frame, to which is attached the cutter bar, and in which is journaled a wheel provided with a serpentine edge upon its periphery. The shaft of this wheel connects with the pulley shaft of the auxiliary frame by the universal joint attached to its pulley shaft. The cutter bar is connected with and receives its motion from the serpentine flange on the wheel of swinging frame.

Seed sowing machinery.—A device by which uniformity in the distribution of fine fertilizers is secured has been patented by Mr. Charles R. Straughn, of Centreville, Md. Above the axle secured to the frame of a seed drill is the seed box, and immediately in its rear, and separated by a partition, is the fertilizer box. The seed is removed from the seed box by a seed-dropping cylinder, and falls into a tapering spout and passes through the hollow shank of the hoe to the ground. A tapering conductor spout is fastened to the bottom of the seed and fertilizing boxes. In bearings on the ends of the fertilizer box a shaft revolves, to which are attached as many bevel gear wheels as there are drills. This shaft is driven from the axle by a belt. Each gear wheel meshes into a bevel gear attached to the upper end of a shaft, the lower end of which works close to the bottom of the fertilizing box, and attached to it are devices which force the fertilizer into the bottom of the box, and it falls through the openings into the conductor spout, and passes with the seed to the ground through the hollow shank of the hoe.

A New Explosive.—A consular report from Sweden gives a description of a new explosive called sebastine, which, it is said, has competed most favourably with dynamite. Sebastine appears to be an explosive based upon nitro-glycerine, but safer to handle than the ordinary dynamite, while more powerful in effect and cheaper to purchase. The greater safety of sebastine depends on two circumstances—first, that the explosive oil is more completely absorbed and bound by a specially prepared kind of charcoal and other ingredients; and secondly, that in ordinary cases it requires no percussion cap to explode. As to use in mining, it is reported that the new sebastine is exploded simply by the fuse, provided the bore-hole is properly secured by a stronger wadding as in an ordinary charge of blasting powder. According to official statements, there has not been one single instance of accident happening when using the new sebastine. The Swedish Government having ordered trials of sebastine against dynamite, it is said to have been proved that sebastine was far superior in effect and about equal in force to English gun-cotton when used in torpedoes. The Consul at Gothenburg adds:—"As an explosive of great power, and offering superior security, particularly for mining and similar purposes, I would recommend the new sebastine, or, more properly, its improved form, virite, to the notice of Her Majesty's Government."

The Value of Ironclads.—Admiral Von Henck has published an article in the *Viertel Jahresberichten* on the value of ironclads in modern naval warfare, and has drawn from the bombardment of Alexandria the conclusion that the armour of the ships is of the greatest value for protecting the life of the crew and for safely protecting the engines and the more vital parts of the ships. If the English ships had been without armour, a considerable loss of men would certainly have been caused, and many guns would probably have been silenced. The circumstance that the unarmoured ships did not suffer much can be explained by the fact that these ships were only of small size, and that the Egyptian artillerists were badly trained in the practice of their guns. The Admiral is of opinion that no unarmoured ship will be able to keep up an engagement for any length of time against the heavy guns of the coast and ship artillery, that the more important parts of all men-of-war at least must be protected by armour, as the latter gives, at all events, a certain shelter against the rounds of the modern artillery, and that the ram and the torpedoes are, of course, formidable weapons in a sea fight, the value of which is not to be underrated, but that both of these weapons are not capable of filling up the place of the artillery, which still will remain the main arm in naval war. It is, however, easy to foresee that in the future sea fights many small vessels of great velocity, and particularly torpedo boats, will be used by the side and under the protection of formidable ironclads, especially where a blockade or a disembarkation is planned. The Admiral thinks that the German navy has to lay all the more stress on these facts, as the navy will in the first instance be used for defensive purposes.

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